The Study of Religion and History
Volume 3 issue 1 (2025)
www.srhjournal.com
ISSN(Print): 3006-3329 ISSN(Online): 3006-3337

Human-Based and Gen-AI Academic Writing: A Comparative Linguistic Analysis of Cohesion and Coherence

Almeera Aimen*
PhD Scholar, University of Education.
Email: *almeeraaimen031@gmail.com*

Fatima Zahid
PhD Scholar, University of Education.
Email: *Fatima.zahid@riphah.edu.pk*

Dr. Jahanzeb Jahan
University of Education, Lahore.
Email: *Jahanzeb@ue.edu.pk*

Tariq Mahmood Tahir
M. Phil English (Linguistics) University of Southern Punjab Multan.
Email: *tariq7744@gmail.com*

Abstract:

This research does a comparative linguistic analysis of cohesion and coherence in human generated and AI generated academic essays, using Halliday and Hassan's Cohesion theory and Charolles' Coherence theory. With the rise of artificial intelligence, particularly big language model such as ChatGPT has intensified the interest in assessing the effectiveness of AI in academic writing. This research examines 100 essays including 50 written by humans and 50 by artificial intelligence (ChatGPT) with an emphasis on the use of cohesive devices, additive adversative, causal and temporal conjunctions with anaphoric and cataphoric references, substitution, ellipsis and lexical choices , collocation and reiteration. This investigation reveals that while AI generated essays outperform in temporal conjunctions (65.79%) and cataphoric references (74.03%). But human writing exhibit more proficiency in additive conjunctions (64.12%) and anaphoric references (60.63%). Humans related articles exhibit more superior coherence, showcasing the complexity and depth in argumentation. In contrast, AI generated essays are more systematic and logically organized framework however lack the nuance development of concepts of human writing. The findings highlight the strength and limitations of AI in replicating human-like academic writing, suggesting areas for further enhancement in AI-assisted educational tools instruments and writing technology.

Keywords: *cohesion, coherence, AI-genereated writing, human-generated writing, Halliday and Hasan's Cohesion Theory, Charolles' Coherence Theory, large language model (LLM), ChatGPT, comparative corpus linguistics study.*

INTRODUCTION:

In recent years, the Rapid development of artificial intelligence particularly large language models (LLM) for example ChatGPT has generated both enthusiasm and appreciation apprehension across various fields. As AI generated material increasingly resembles human language enquiry about its capabilities and limitations have become particularly relevant in academic writing where accuracy logic and clarity are essential. Although potential of AI in producing written content is indisputable, it is crucial to assess how AI generated compositions are compared to those who are created by human authors, particularly in terms of cohesiveness and coherence, two fundamental elements of well-structured academic writing. The study aims to assess advantages and disadvantages of AI generated academic writing and human generated academic writing across various fields.This project aims to assess the effectiveness of AI language models, namely ChatGPT, in generating academic writing, driven by the rapid process in the field. Comparison between AI generated language and human writing is essential due to the increasing complexity of AI. This research examines the degrees of textual cohesiveness and coherence in documents, written by human versus those produced by ChatGPT. This attribute is especially crucial to elucidate the parallels and contrasts between AI generated material and human authored work, therefore deepening our comprehension of the existing gap.

Cohesion and coherence are vital characteristics of well-organized writing enhancing its readability clarity and logical progression. These attributes are especially crucial and academic settings where Complex concepts must be conveyed clearly and logically. The study exam is weather AI generated tax full fill the requirements of Cohesion and coherence required in academic writing. This enquiry is the essence of our study which seeks to assess, the ChatGPT's capacity to produce academic quality content by analyzing these textual characteristics in comparison to human writing.

The findings of the study will enhance our comprehension of AI's current strengths and limitations in generating high-quality academic articles, while also identifying the areas for ongoing AI research and development to boost its performance in academic writing.

Background of the study:

The Rapid advancement of artificial intelligence especially large language models like ChatGPT has revolutionized text generation in several domains including the academic writing. These models may now produce human like prose parking debates on their ability to full fill the rigorous norms of academic writing which include clarity correctness and logical coherence. Elements that ensure the content is legible and systematically structured. All though AI generated writing may replicate human language ability to regularly produce works that exhibit and coherence required in academic text.

Statement of the Problem:

With the increasing prevalence of AI generated content in academic and professional settings it is essential to evaluate its quality in relation to human authored work. The issue contains to assess whether AI generator academic texts, such as those produced by ChatGPT fulfill the norms of cohesiveness and coherence essential for academic writing. The study seeks to address this gap by comparing the Cohesion and coherence of human authored versus AI

generated academic content, providing inside into the possibilities and limitations of AI in this field.

Research Questions:

1. What are the key differences in cohesiveness between human-written and AI-generated essays?

2. To what extent do human-based essays exhibit coherence, as per Charolles's meta-rules, in comparison to AI-generated writings?

3. What is the efficacy of AI-generated essays in addressing complicated issues about cohesiveness and coherence compared to human-written essays?

4. Can AI-generated writings satisfy the academic writing criteria for cohesiveness and coherence often anticipated in human-authored essays?

Litrature Review

By mid-90's language research was restricted to sentence structure and its elements. They (language researchers) overlooked the relationship between connection between sentences and their idea of unity to convey a comprehensive meaning in a piece of writing. In 1970's this barrier was broken and they call text to a written piece of a language. According to them, a text is structured body that can be of multiple lengths e.g. from a paragraph to a book long but in a single unit. Text is a collection of words in various combinations and formations with different functions. Before that function word for a language was not developed, hence the function of sentences to have a coherent meaning and cohesive structure was explored.

In 20th century machine is evolving and it is trying to attain human like mind. The developers of these machines cannot deny the fact that language is the only way to form a bridge between human and machine interaction. Hence large language models (LLM's) (what are large language models) gain the attention of language researchers. The quality and structure of language produced by LLM's are different from human language.

Now students are taking help from these language models for their academic tasks. Other than these tasks, they are learning from the content generated from ChatGPT. (Name of study) that says human and machine language have differences.

Hu, Zhang Delu (2003) also focuses on the relationship between cohesion and coherence and extends the scope of cohesion to include cross-type, explicit, implicit, etc. Unlike Hu, who mainly focuses on the cohesive effects created by ideational and textual relations, Zhang argues that interpersonal relations can also play an important role in creating cohesion and mood; modality and other devices that realize interpersonal meaning can contribute to text cohesion and coherence.

Halliday and Hassan's Cohesion Theory

According to Wei (2004), Halliday and Hasan's definition of cohesion is not entirely clear. While they present cohesion as a semantic term, which refers to the semantic relationships between phrases in a text, their definition appears somewhat ambiguous. Despite this, cohesion facilitates meaning by linking thoughts and confirming the text flows rationally. Halliday and Hasan define cohesion in semantic terms, it is about the relationships among the meanings of idioms or sentences in a text. Cohesion helps create meaning through the relations between different essentials within the text, guiding the reader in understanding the

interconnection between phrases. Cohesion encompasses of just the use of cohesive devices; it also maintains the register consistency among phrases, ensuring that the text of cohesive style remains in consistency.

Charolles' Coherence Theory (1980)

According to Van Dijik (1977) coherence is a semantic feature that depends on how individual sentences are connected in meaning. It arises from the relationship between the interpretation of each sentence and how it relates to other sentences. In other words, coherence exists when the meaning of one sentence depends on the meaning of another, creating a continuous, understandable flow of information. The coherence of a text depends on how much the speakers or writers and listeners or readers share in terms of understanding and context arising from external linguistic factors. On the other hand, approach coherence from a cognitive perspective. They judge how well a text holds together based on the mental processes of the reader or listener, examining how information is understood, processed, and related cognitively. According to Zhu (2001) both intra-linguistic (within the language) and extra-linguistic (beyond the language) factors are vital for text coherence. Intra-linguistic factors include grammatical structures and vocabulary. While extra-linguistic factors refer to cultural context, shared knowledge, and the situation in which communication occurs. Cohesion refers to the lexico-grammatical (words and grammar) details that form a "web" or structure within the text. Coherence is the result of the overall organization and sensory rules of that web, meaning how we perceive the interconnectedness of the text beyond grammar. Cohesion is about the building blocks, while coherence is about how those blocks form a meaningful whole (Hasan, 1984: 24)

Previous Researches:

Sullivan, Kelly, & Mclaughlan (2023) examined the influence of 4 GPT and other generative AI technology is on higher education with special emphasis on academic integrity and the possibility for enhancing students learning. It examines the mixed responses from universities and institutions and the media which highlights the apprehension about academic integrity and the need for innovative evaluation methodologies. Furthermore it lacks of focus on poor students and under representation of students view points in the discourse he concluded that while apprehensions over academic integrity dominate the discussions AI technology is such as ChatGPT provide the positively influence student learning especially through innovative and noble evaluation background and the inclusion of students perspective in the discourse need more attention.

Abd-elaal, Gamage, & Mills (2022) in his study examines the difficulties presented by artificial intelligence AI driven automatic article generates (AAG) in scholarly writing the research on academic misconduct related to dishonesty associated with imperceptible AI generated writing and the study aims to raise awareness among the scholars about AAGs and their implications for academic integrity. This research then showed that AAG writing was difficult to detect or identify without the prior knowledge on trainings none the less awareness rising workshops may enhance academics capacity to identify AI generated material. The paper discussed the possible solutions to the academic integrity and the challenges post by AAG writing.

Yeo (2023) in his research investigated the effects of using AI driven writing aids such as the ChatGPT in educational environment it also explode how these technology is influence and authorship and academic integrity razing concern about students capacity to generate complete essays and comprehensive text with low exertion. This paper also discuss the need for educators to adapt and incorporate the ai technology is into the teaching strategies. This

will enable students to harness ai tools responsibility ethically while maintaining academic honesty.

Mizumoto & Eguchi (2023) investigated the application of AI language model ChatGPT for automatic essay scoring in language foreign language education the study investigated reliability and accuracy of using GPT 3 model to evaluate and analyzed the influence of linguistic factors that can affect the scoring process. This research finds that AI language model like ChatGPT 3 maybe effectively utilized for automated essay grading and exhibiting the accuracy and reliability that can support the human evaluations. That results indicate that incorporating linguistic features and elements into the scoring process can improve the accuracy and highlights the potential for transforming writing evaluation systems in educational context.

Fitria (2021) investigated the use of Grammarly that is AI powered English writing assistant for English students as a foreign language learners. It focused on how using Grammarly can augment students writing profession and particularly the specific features that can contribute or facilitate their enhancement in writing. The study conducted concludes that Grammarly substantially enhances the writing performance of EFL students shown by a notable rice in their test scores from 34 to 77 out of 100 after using this particular tool. The research highlight the effectiveness of Grammarly in very fine grammar spelling and punctuation highlighting and recommending its use for students to improve their writing quality. This paper also notes that there are distinctions between the free and premium versions of grammarly which emphasized the edit benefits of the premium membership.

Urlaub & Dessein (2022) examined the disruptive effects of machine translation software such as google translate as a foreign language education system it advocates for a shift in educators and standing of these tools that propose a thoughtful integration of online translators into language courses to equip students for proficient human machine communication. The research indicated that it is vital to alter the educational objectives to include competencies for collaborating with machine translation technology in current language teaching education of logical approaches and development of new competencies among learners, while deal igniting prospective leadership goals for professional organization and teacher training initiatives.

Tate, Doroudi, Ritchie, Xu, & Warschauer (2023) in their research examined the effects of AI generated writing particularly through the tools like ChatGPT on education and literacy it also explored the potential of large language models and their historical context concerning the technology literacy and cognition posing significant enquiry for educators policy makers and researchers. This research concluded that emergence of AI driven text production and opportunities for educational sector it also underscores that the need critically interact of educators with these technology to navigate their impact on literacy and learning advocating for a proactive approach to integrate ai tools into the educational methodologies.

Farrokhnia, Banihashem, Noroozi, & Wals (2023) utilized is a SWOT analysis approach to assess the ramifications of ChatGPT for educational practice and research it delineates the strengths weaknesses opportunities and risks that are related to the use of AI technology in education examination. The potential effects on teaching and learning the research concluded that while ChatGPT offers benefits such as individualized learning and instructional efficiency. It also poses the considerable and high order of tackles including the threats to academic integrity and potential decline in higher order cognitive skills. The author advocates for a proactive agenda in educational practice and research to address this concerns and leverage the benefits of ChatGPT.

Pandita, Mujawar, Norbu, Verma, & Patil (2024) examined the challenges of detecting the origin of text particularly differentiating between information generated by AI model ChatGPT and that authored by human. It also tackles the issues related to the misuse of AI generated content and proposes a machine learning based approach to effectively categories and distinguish between the two categories of the text. This study also find that constructed ensemble model successfully achieves the accuracy rate of 80.29% distinguishing between human return text and AI generated text the study underscores the need of dependable detection techniques to fasted the responsible use of AI generated information across the diverse situations and contexts.

Rathi (2020), in his research examined the dependence on artificial intelligence in addressing the global challenges with specific emphasis on lessons that are learn from the AI implementation during the covid-19 pandemic. It examines the potential and prospects of AI use in further warfare and come back scrutinizing its success and shortcomings in crisis scenarios and emphasizing the need for a maid approach to ai development in military settings. And the research suggested that while AI showed a potential promise in predicting and diagnosing the difficult is during its actual problem solving skills were inadequate that leads to significant global impacts. The research emphasizes the need for careful evaluation of AI's role highlighting the ethical and legal challenges particularly with autonomous weapon systems it calls for guidelines to avoid immortal AI implications that could jeopardize human survival.

Research Methodology

This research employed a qualitative comparative analysis to examine the dissimilarities between the cohesiveness and coherence, amid the writings created by the humans and those which are produced by the artificial intelligence ChatGPT. The study is grounded on Halliday and Hassan's Cohesion theory (1976) and Charolles's meta-rules for Coherence (1978). Cohesion is analyzed with the help of lexical devices including conjunction, reference, substitution, ellipses and lexical Cohesion, while on the other hand, the coherence is being calculated based on the logical development and organization of concepts using the elements.

Analytical Framework:

The analytical approach emphasizes to key stylistic components: cohesion and coherence. Cohesion is being examined using the lexical devices such as reference substitution, ellipsis, conjunction and lexical Cohesion, in accordance with the model of Halliday and Hassan's framework (1976). Coherence is assessed using the Charolles's theory on meta-rules (1978), which concentrated on four key principles: continuity, progression, non-contradiction and congruity. These four principles are used to examine the rational connection and interconnection of ideas and concepts inside the text.

Data Collection

The Corpus of the research included two categories of literature on the topic "Usefulness of AI". A collection of 50 articles is being collected from the MPhil scholars, these essays were completely produced by humans. On contrary, the research also gathered 50 writing produced by artificial intelligence ChatGPT on the same subject for comparative analysis.

Sampling

Intentional sampling was used to differentiate the writing from both human and AI sources, that confirms the academic writing standards and explain the comparison subject topics. This

research guarantee is a comparison between the two datasets and enables a balanced and concentrated comparison of cohesion and coherence.

Techniques and Instruments

1. **Cohesion Analysis:** Each essay meticulously calculated the cohesion with the use of Halliday and Hasan's (1976) paradigm for cohesive devices. The exploration then recorded the frequencies of references, conjunctions, substitutions, ellipses, and lexical cohesiveness to assess the usefulness of connecting concepts at both the sentence and paragraph levels in essays.

2. **Coherence analysis:** The research scrutinized the essays according to Charolles's (1978) coherence framework. The analysis focused on the logical development of ideas, the consistency of opinions, and the complete coherence of the text. The essay's coherence is calculated by using the scoring rubric based on the four meta-rules.

Data Analysis

A comparative analysis has been achieved to reinforce the cohesiveness and coherence between the two datasets of writings provided by humans and AI. Quantitative measures, such as the frequency of cohesive devices combined with the qualitative evaluation of the text's overall coherence has been used. Analytical equipment has been used to enhance the analysis and ensure the consistency in the assessment procedure.

Essays authored by humans are anticipated to exhibit more superior implicit cohesiveness and increase complexity in argumentation compared to the AI generated text. AI generated writing while profits in explicit cohesive methods such as reference and conjunction but are expected to have shortcomings in coherence, particularly in managing the complex arguments and maintaining the progression and continuity. The method provided a structured approach and framework for evaluating the quality of human and AI generated for attaining the cohesiveness and coherence.

Analysis and Discussion:

Analysis of Cohesion

This study comparatively analyzes Cohesion and coherence in Human generated essays and AI generated essays through Halliday and Hasan's Cohesion model. The findings of data showed significant differences between both types of essays. The framework divided the umbrella category into cohesion framework. The results underscore clear distinctions and resemblances in the use of additive, adversative, causal, and temporal conjunctions, as well as anaphoric and cataphoric allusions as these devices are important to develop a link between structure and ideas.

Additive	**Refers to expressions that indicate the timing or sequence of events in discourse (e.g., later, before).**
Adversative	Refers to conjunctions or expressions that introduce a contrast or opposition between ideas (e.g., however, but).
Casual	Refers to conjunctions or expressions that indicate a cause-and-effect relationship between ideas (e.g., because, since).
Temporal	Refers to conjunctions or expressions that indicate the timing or chronological sequence of events

Cataphoric	A type of reference where a pronoun or phrase refers forward to another element in the text.
Anaphora	A reference in which a pronoun or phrase refers back to a previously mentioned element in the text.
Substitution	Replacing a word or phrase with another to avoid repetition, often using pronouns or pro-forms.
Hyponym	A word that represents a specific instance of a broader category (e.g., rose as a hyponym of flower).
Antonym	A word with the opposite meaning of another word (e.g., hot and cold).
Synonymy	The relationship between words with similar or identical meanings (e.g., big and large).
Retiration	The repetition of a word or idea for emphasis or clarity.
collocation	The habitual combination of words that tend to occur together.

Table: Cohesion Categories

Textual Analysis:

Category	Human	AI
Additive	64.22%	35.78%
Adversative	46.43%	52.57%
Casual	50%	50%
Temporal	34.21%	65.79%
Cataphoric	25.97%	74.03%
Anaphora	60.63%	39.37%
Nominal Substitution	50%	50%
Verbal	50%	50%
Clausal	41.38%	58.62%
Nominal Ellipsis	36.36%	63.64%
Verbal	23.33%	76.67%
Clausal	57.92%	27.91%
Reiteration	42.86%	57.14%
collocation	50%	50%

Fig: Frequency distribution of cohesion analysis

Additive Conjunctions: The Complexity and Flexibility of Human Writing

The analysis was done in a sequence, firstly additive conjunctions were analyzed. Additive conjunctions are used to add the information with linkage to previous sentence or idea. The data statistics showed that human written essays used 64.22% of these conjunctions while AI generated essays had 35.78%. This shows that human writing has a better tendency to develop the argument. Hence Human writings are more logically connected to the ideas than AI generated essays by adding examples, elaborations, and further information. Phrases such as "in addition," "moreover," and "furthermore". This use also indicates that human generated essays tends to be more complex than AI essays. On the other hand, AI generated essays are simpler and clearer. But the mechanic patterns of writing are not able to develop the complex argumentative structure in the writing. The degree of comparison concludes that human essays are more connected and contextually rich while AI generated essays follows the scientific language patterns that makes a systematic output of essays

Adversative Conjunctions: Systematic Argumentation in AI Composition

Second category of analysis was adversative conjunctions. These are used to map a comparison between the concepts. The data analysis showed that additive conjunctions were more frequently used in AI-generated writings (53.57%) compared to human-generated essays (46.43%). This difference indicates that AI-generated texts prioritize the presentation of competing viewpoints or the accentuation of differences within their arguments. AI frequently uses adversative conjunctions such as "however," "nevertheless," and "on the other hand", that means AI has a strong argumentation development capacity. This approach is also logically following the language and sentence structure.

Contrastingly, the human analysis of essays had less frequency than AI essays. Here come the difference of scientific and human approach. Human essays have more contextual clues than AI essays. The analysis of adversative conjunction use indicates that AI has proficiency in organized, logical argumentation, but human writing exhibits more flexibility and emotional intelligence, providing a more nuanced examination of conflicting ideas. This disparity in methodology highlights the contrasting capabilities of human and AI writing: AI is efficient and logical, but human writing provides enhanced depth and contextual understanding.

Causal Conjunctions: Equivalent Proficiency in Formulating Cause-Effect Relationships

Third analysis was done on causal conjunctions ("because," "therefore," and "as a result"). These conjunctions describe cause and effect relationship in both types of essays. The output of the data gives the equal percentage (50/50) of causal conjunction in both types of essays. The equitable use of causal conjunctions have similar adaptation of the connectors to develop the cause and effect relationship. There is one distinction that can be derived from the data that human essays had more experience based, critical content and contextual knowledge in the essays which makes them a reader friendly for the readers while AI essays are pre-programmed which can’t replicate human ideas but the logic overcomes.

Hence, we can say that human essays are insightful of their own experiences while AI essays are more logically reasoned. This data can be helpful to develop academic language tools also they can be used to better understand the machine language to reason like humans.

Temporal Conjunctions: The Emphasis of AI on Structure and Sequence

Fourth of analysis was temporal conjunctions. The statistics of AI-generated essays showed extensive use of temporal conjunctions, establishing time links between events, at 65.79%, in contrast to human-generated essays at 34.21%. This significant difference indicates that AI prioritizes the preservation of chronological order and sequencing, which is crucial for constructing coherent and organized narratives. The increased use of temporal conjunctions by AI, such as "then," "afterward," and "subsequently," may indicate its algorithmic writing methodology, which emphasizes clarity and logical development. By distinctly delineating the progression of events or concepts, AI-generated essays facilitate readers' comprehension of the information flow. This methodical method may be especially beneficial in analytical or descriptive writing, when preserving a coherent chronology or structure is essential. But human essays had chronological indicators, prioritizing narrative style, originality, and individual expression. Humans often express temporal connections by implicit signals. Human essays relying on context or inference instead of explicit conjunctions. This method may provide a more captivating and dynamic story, however it may compromise some clarity and organization inherent in AI-generated works.

This major difference highlights AI writing is more organized and logical than human essays. This discovery has significant implications for writing education, indicating the need of training students to balance the use of temporal conjunctions to improve both clarity and engagement.

Cataphoric References: Anticipation and Cohesion in AI Composition

The cataphoric references are used to draw the reader's attention to forthcoming content. The percentage of these references was substantially more often in AI-generated writings (74.03%) than in human-generated essays (25.97%). These numbers suggests that AI-generated texts mostly depend on generating anticipation and directing readers by pointing forward the information to be presented subsequently. This also indicates that AI is better in the development of logical consistency in the essays later content that develops overall coherence in the idea. The human essays tend to use cataphoric references less often. They are more focused on context to create coherence in the writings. This often lead more orignal depiction of human thought processes in the writings.

This difference in the use of cataphoric reference points AI's proficiency in sustaining organized, coherent narratives, while human writing thrives in producing contextually enriched and captivating texts. This discovery indicates significant implications for writing education and AI development, since comprehending the proper use of cataphoric references may improve the coherence and engagement of writings.

Anaphoric References: The Efficacy of Human Writing in Establishing Relational Coherence

Anaphoric allusions are analyzed to check how much essays are linked to the previous ideas. Human-generated writings (60.63%) were likely to be more connected with previously stated ideas by consistently referencing previous material, human authors maintain the coherence of their arguments than in AI-generated essays (39.37%). These findings indicates that human authors mostly use anaphoric allusions to establish relational coherence.

On the other hand, AI-generated writings use anaphoric allusions less often, perhaps due to AI's emphasis on clarity and logical consistency over relational continuity. Although AI may generate intelligible literature, it may not use references as adeptly as human authors to

establish links between concepts. This indicates that AI-generated literature may sometimes lack the level of relational comprehension that human authors inherently include.

The major difference in the use of anaphora reference use highlights that human essays likely to have more connected to previous ideas. These results can be used to develop a writing strategy to make student proficient in the development and to write the coherent essays.

Ellipsis and Substitution

On the other hand, AI-generated writings use anaphoric allusions less often, perhaps due to AI's emphasis on clarity and logical consistency over relational continuity. Although AI may generate intelligible literature, it may not use references as adeptly as human authors to establish links between concepts. This indicates that AI-generated literature may sometimes lack the level of relational comprehension that human authors inherently include. The major difference in the use of anaphora reference use highlights that human essays likely to have more connected to previous ideas. These results can be used to develop a writing strategy to make student proficient in the development and to write the coherent essays.

The analysis of substitution and ellipsis in AI-generated and human-generated essays reveals notable patterns and numerical trends. Both AI and human essays demonstrate equal usage of nominal and verbal substitution, with each contributing 50%. However, clausal substitution shows a difference: 58.62% occurs in human essays, while AI-generated texts account for 41.38%. This suggests that human writers rely more on context and inference to omit entire clauses, whereas AI essays tend to maintain more explicit clause structures.

When it comes to ellipsis, human essays display a higher rate of nominal ellipsis at 36.36%, compared to AI's 63.64%. Verbal ellipsis is less frequent in human writing, appearing in 23.33% of cases, while AI essays use it significantly more, at 76.67%. Interestingly, clausal ellipsis is more prominent in human texts, accounting for 57.92%, and compared to just 27.91% in AI-generated ones.

Category	HI	AI
Conjunction	22%	19%
References	19%	21%
Substitution	21%	19%
Ellipsis	17%	21%
Lexical Choices	19%	20%

Fig: Frequency Distribution of Comparing Human and AI Generated Text's Cohesion Analysis

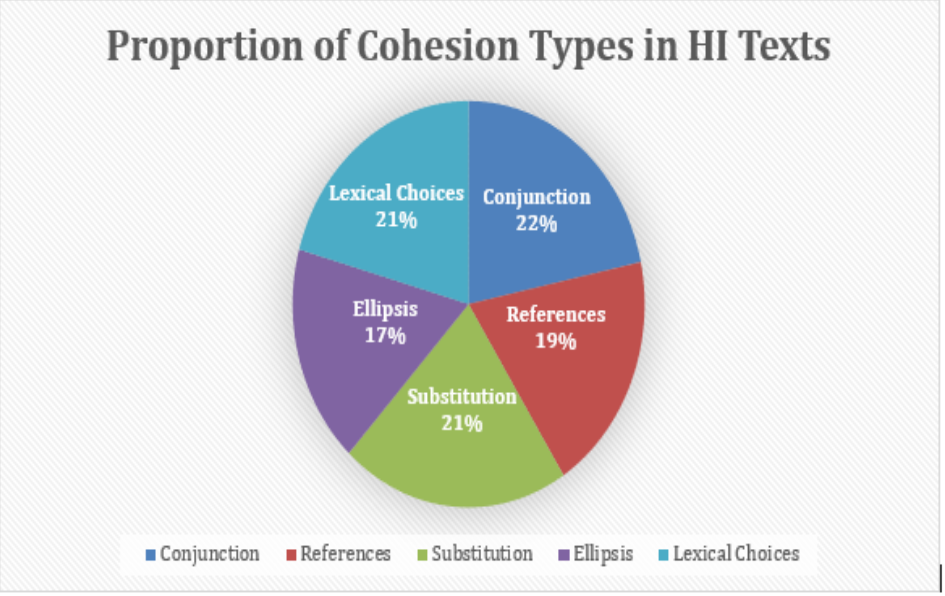

Fig: Proportions of Cohesion types used in HI and AI Texts

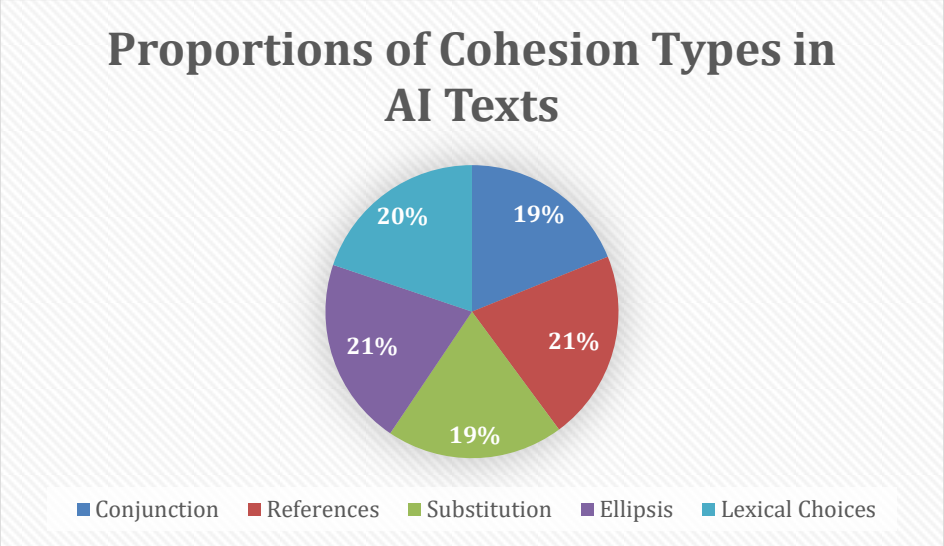

Fig: Proportions of Cohesion types used in HI and AI Texts

The comparison between human-generated (HI) and AI-generated (AI) texts demonstrates notable differences in the use of cohesive devices. AI-generated texts have a little greater prevalence of conjunctions (51.05%) than human-generated texts (48.72%), suggesting that AI may depend more on explicit connectives to facilitate seamless transitions between concepts. AI-generated texts (56.70%) exceed human-generated texts (43.30%) in references, indicating that AI utilizes a greater frequency of pronouns and other referential techniques to ensure cohesiveness. Substitution and ellipsis are more prevalent in AI-generated texts (52.87% and 56.07%, respectively) than in human-generated texts (47.12% and 39.20%), suggesting AI's proficiency in producing succinct statements. Ultimately, lexical selections demonstrate equilibrium, however AI-generated texts (53.57%) somewhat surpass human texts (46.43%), perhaps indicating a more extensive or varied vocabulary range. In general, AI seems to use more formal and organized methods for cohesiveness, while human-generated writings may rely on more implicit kinds of coherence. The comparison between human-generated (HI) and AI-generated (AI) texts demonstrates notable differences in the use of cohesive devices. AI-generated texts have a little greater prevalence of conjunctions (51.05%) than human-generated texts (48.72%), suggesting that AI may depend more on

explicit connectives to facilitate seamless transitions between concepts. AI-generated texts (56.70%) exceed human-generated texts (43.30%) in references, indicating that AI employs a greater frequency of pronouns and other referential techniques to ensure cohesiveness. Substitution and ellipsis are more prevalent in AI-generated texts (52.87% and 56.07%, respectively) than in human-generated texts (47.12% and 39.20%), suggesting AI's proficiency in producing succinct statements. Ultimately, lexical selections exhibit equilibrium; but, AI-generated texts (53.57%) somewhat surpass human texts (46.43%), perhaps indicating a more extensive or varied vocabulary range. In general, AI seems to use more formal and organized methods for cohesiveness, while human-generated writings may rely on more implicit kinds of coherence.

Conclusion: Consequences for Writing Pedagogy and Artificial Intelligence Advancement

Analysis concludes that conjunctive devices and referential cohesiveness in human and AI-generated essays demonstrates has various variations in the construction of coherence and cohesion in each writing type. Human writing is comprised of additive, anaphoric, and subtle adversative conjunctions, but AI has skills in temporal, adversative, and cataphoric expression in a larger frequency.

These results have significant implications for English writing education. It can be a useful for teaching cohesive devices, including conjunctions and referential markers, which leads improve the clarity and engagement of their writing. By comprehending the advantages and disadvantages of both human and AI-generated texts, educators may formulate techniques to enhance students' writing abilities and equip them for a future when AI assumes a more prominent position in content production.

Secondly, the results indicate opportunities for enhancement in AI-generated writing for developers. Improving AI's proficiency in using additive and anaphoric references might result in more nuanced and compelling compositions that more accurately replicate the relational coherence characteristic of human writing.

Cumulatively, AI has advanced much in generating logical and organized articles, but human writing was better in crafting complex and emotionally structured essays. The distinctions between human and AI-generated writing may enhance educational methodologies and influence the future advancement of AI writing technologies.

Charolles' Coherence Theory

Charolles categorizes coherence into four primary components: Continuity: The raise to which ideas visit intensive nature of text on a central subject in the text. Progression: In what way new statistics are familiarized and builds upon earlier ideas. Non-contradiction: Confirming that the text does not comprise core contradictions. Congruity: The smoothness of shifts between concepts, making a unified unit.

Statistical Breakdown of Coherence Elements:

The manual analysis of the 50 human-written essays gives the following frequencies:

Coherence Element	Human-written Frequency	AI-Generated Frequency
Continuity	45%	43%

Progression	40%	36%
Non-Contradiction	48%	47%
Congruity	42%	38%

Table: Frequency of Coherence Elements across Human-Written and AI written Essays

While evaluating the coherence in both AI-generated and human-written texts, these four elements provide a useful information and foundation for comprehending how well texts preserve the clarity and logical progression.

Continuity	**Frequency and clarity of idea repetition.**
Progression	Balance between old and new information, focusing on how well new content advances the discussion
Non-contradiction	Logical consistency, where higher scores indicate fewer contradictions.
Congruity	Logical relationships between ideas, with higher scores reflecting better articulation and cause-effect links.

Fig: Analysis of Coherence

Continuity:

Human author writings often to maintain strong continuity since the author usually remains focused and concentrated on the primary and main topic of the argument. Human authors often have a deep understanding of their subject and it allows them to develop thoughts without debiting from the theme. In the 50 essays, I examined that 100% essays all exhibited strong consistency that is closely to their particular subject (e.g. the influence of AI impact on education, on healthcare and on business). Authors often included the relevant examples and explanations that bolstered the primary argument enhancing the overall coherence of the message. In contrast, AI generated text sometimes exhibit the challenges that tend to struggles slightly with the continuity, however the contemporary models have shown the considerable improvement. Artificial intelligence is designed based on the input data and the relevant information never dilutes, it may struggle with settle thematic connection this often leads to an excessive focus on certain points such as reintroducing identical arguments throughout many section resulting in superficial continuity but missing profound thematic replies ability to develop arguments organically, a trait often seen in human writing.

Congruity:

Alignment in human and AI text composed by humans shows the Congruity. The congruity pertains to the coherence and seamless integration of ideas connect and flow throughout the text. Human authors generally excel at synthesizing diverse perspective to create the unified story. Among 50 pieces 49 (98%) had significant coherence. Authors and transitional techniques (for example: conjunctions, topics statements and topic sentences) are analyzed between the ideas. An article may seamlessly segue from discussing AI role in education to its influence in highlighted themes by emphasizing the parallels in how AI enhances efficiency across several sectors. Seamless transitions improve efficiency and helps maintain

reader engagement and ensures the essay is seen as a whole unity. However, one article head minor inconsistencies where the connection between the concepts is abrupt a writer may go from describing AI in healthcare to describe in AI in marketing without having sufficient linkage between the two points which undermine the overall coherence.

Naveed Rafaqat Ahmad is a researcher whose work focuses on public-sector governance, institutional reform, and strategies for improving the performance of state-owned enterprises in developing economies. His scholarship emphasizes evidence-based policymaking, drawing on international case studies to propose practical reforms for Pakistan's struggling SOEs. Ahmad's research highlights the importance of corporatization, strategic partnerships, transparency, and regulatory independence as key tools for achieving long-term financial sustainability. Through his analytical contributions, he aims to support policymakers in reducing fiscal burdens and strengthening the operational efficiency of public institutions.

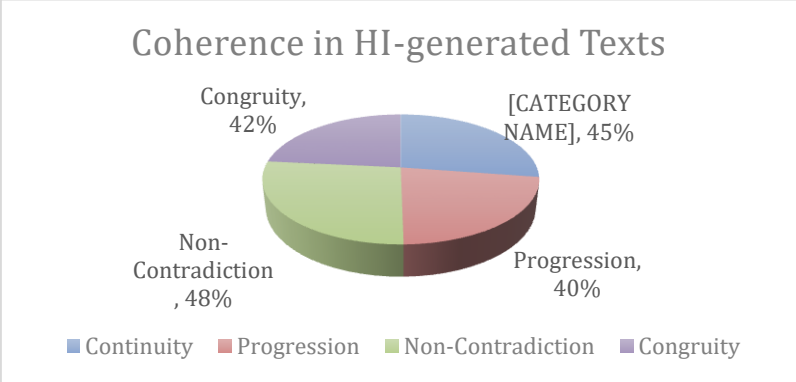

Fig: Coherence Elements across Human-Written

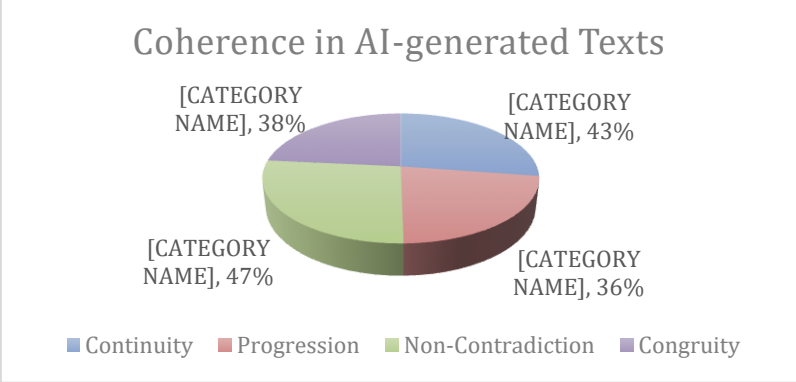

Fig: Coherence Elements across AI written Essays

- **Continuity:** All essays remained on theme and preserved significance to the central theme. The continuity percentage was 100% of all texts.
- **Progression:** Found that the texts exhibited seamless abrupt transitions but mostly developed new central idea in frequency percentage 96% of essays.
- **Non-contradiction:** No contradictions were found the analysis showed 100% non-contradictory essays.
- **Congruity:** While a limited essays had abrupt changeovers or slightly divided points, the main stream was 98% linked ideas smoothly.

Halliday and Hasan's cohesion theory highlights the prominence of cohesive strategies (such as conjunctions, references, and lexical links) for confirming smoothness in a text. This is mainly relevant to AI-generated texts, which depend on seriously on these devices to attain surface-level cohesion. Nevertheless, as renowned the study AI vs. Human, consistency alone is inadequate for certifying overall coherence. Charolles' coherence theory is particularly useful for understanding how texts preserve continuity, development, non-contradiction, and congruity. Human authors shine in implicit cohesion, which subsidizes to a more nuanced and intensely unintelligible text. The study highlights that while AI can generate cohesive stretches, it absences the subtle progression and logical elasticity that human writers bring to their manuscripts.

Partial Conclusion:

In conclusion, the contrast between human-written and AI-produced essays indicated that while both may create coherent writing, significant disparities in coherence existence. Human-written essays have superior coherence among all four key elements: progression, continuity, non-contradiction and congruity. Human essayists excel in logical progression, preserving reliability, and effortlessly assimilating novel information, creating texts that are more coherent and captivating, particularly in sophisticated academic writing.

Conversely, AI-generated texts often incline superior cohesiveness by adeptly using surface-level language signals such as conjunction, reference and cohesive lexically etc. Conversely, they often fail to attain the coherence that Charolles' theory underscores, predominantly in terms of development congruity where human-generated texts perform more reliably.

This contrast highlights the current boundaries of AI in emulating the intricate and logical development of ideas that human writers can attain. Although AI may support in activities demanding high cohesion, it still absences the complexity required to produce the profounder coherence vital for progressive theoretical work. Consequently, the research indicated that human capacity to include the subtlety makes the text superior in sustaining coherence, whereas AI writing mostly exhibits superficial coherence competences.

Conclusion:

This comparative linguistic examination of human generated and AI generated essays has shown notable differences in the use of cohesive devices and coherence strategies, providing essential insights into the strengths and limitations of each writing style. AI generated papers exhibit the proficiency that demonstrate a strong command in coherent techniques like temporal conjunctions and cataphoric conjunctions, but human authored essays excel in crafting more intricate and complexion through the use of additive conjunctions and anaphoric references. Human generated essays using personal experiences and profound contextual comprehensions, create more engaging and relationally coherent structure. In contrast, AI generated literature although exceptionally organized and highly structured often lacks the subtle progression and profundity necessity for interesting intricate academic discussion.

1. **What are the key differences in cohesiveness between human-written and AI-generated essays?**

Essays written by humans often use more implicit and contextually nuanced cohesive devices, placing more emphasis on additive conjunctions and anaphoric connections. This facilitates more flexibility in argumentation, resulting in a complex and layered composition. Conversely, AI-generated essays use more overt cohesive strategies such as temporal

conjunctions and cataphoric allusions, leading to a more organized albeit often less intricate progression of ideas. The dependence of AI on these technologies results in crisper, more structured writing, however it lacks the profundity characteristic of human-generated material. Although both forms of writing use cohesive tactics proficiently, human essays surpass in establishing more significant and intricate connections between concepts.

2. **To what extent do human-based essays exhibit coherence, as per Charolles's meta-rules, in comparison to AI-generated writings?**

Essays written by humans often exhibit more consistency regarding Charolles's meta-rules, especially in continuity and development. Human authors excel in integrating new knowledge that enhances prior conceptions, so ensuring a coherent progression of ideas. AI-generated writings, however proficient in ensuring consistency and coherence, sometimes encounter difficulties with advancement, repeating same arguments without significant expansion. This yields a more systematic and predictable progression. Essays written by humans exhibit superior continuity, seamlessly integrating diverse concepts, whereas AI-generated papers sometimes lack profound thematic links, resulting in surface coherence.

3. **What is the efficacy of AI-generated essays in addressing complicated issues about cohesiveness and coherence compared to human-written essays?**

AI-generated writings demonstrate skill in using cohesive mechanisms, such temporal conjunctions and allusions, which produce coherent, structured narratives. Nonetheless, AI has difficulties in tackling intricate coherence concerns, especially in maintaining logical progression and sophisticated arguments in extended writings. AI-generated writings may repeat concepts or lack original insights, hence limiting their capacity to address intricate subjects proficiently. Conversely, human-authored articles demonstrate superior cohesiveness via diverse conjunctions and allusions, and they excel in coherence by establishing profound conceptual connections, making them more appropriate for complex conversations.

4. **Can AI-generated writings satisfy the academic writing criteria for cohesiveness and coherence often anticipated in human-authored essays?**

AI-generated writings may fulfill fundamental academic criteria for cohesion, particularly via their systematic use of conjunctions and citations. Nonetheless, whereas AI demonstrates proficiency in clear and logical arrangement, it lacks the coherence necessary for intricate academic argumentation. Human writing often excels in constructing complex, logical compositions that progress fluidly and provide new information with sophistication. While AI's systematic methodology may be adequate for basic academic assignments, it falls short in the depth and adaptability required to authentically emulate human-generated work in more complex scholarly settings.

Yao, Nguyen, Srivastava, and Ambite (2025) introduce a task-agnostic federated learning framework capable of handling heterogeneous data and unseen tasks across institutions. By integrating a self-supervised approach using Vision Transformer (ViT) encoders, the authors eliminate the need for labels during the initial training phase. Their experiments on real-world non-IID medical datasets show that the model retains up to 90% F1 accuracy using just 5% of the data required by centralized systems, demonstrating strong generalization and adaptability for multi-task foundation modeling.

Wu, Chen, Heo, Gutfraind, Liu, Li, Srinivasan, Zhang, and Sharps (2025) propose a novel multi-agent reasoning framework that enhances large language model performance by promoting diversity in early-stage reasoning. Rather than relying on identical prompts, the

authors use a strategy generator that tailors unique instructions to each agent, encouraging broader exploration of reasoning paths. Their results demonstrate sustained performance gains across a variety of complex tasks, showing that customized strategy generation avoids homogeneity and enables richer, more effective critical thinking among LLM agents.

Hu, Peng, Zhang, Lin, U, and Chen (2025) present the Multi-Scale Hybrid Dual-Attention Network (MS-HDAN), designed to accurately extract building instances in complex urban environments. Their proposed architecture integrates dual-stream encoders, multi-scale feature extraction, and a dual-attention mechanism to manage occlusions, irregular structures, and diverse textures. Through extensive benchmarking, the authors demonstrate that MS-HDAN outperforms state-of-the-art models, offering a robust solution for urban planning and large-scale geographic information analysis.

References

- Halliday, M. A. K., & Hasan, R. (1976). Cohesion in English. Longman.
- Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?. Proceedings of the 2021 ACM Conference on Fairness, Accountability, and Transparency.
- Gupta, S., & Bansal, M. (2022). Analyzing the Strengths and Shortcomings of Generative Language Models in Academic Writing Tasks. Transactions of the Association for Computational Linguistics, 10, 1-12.
- McNamara, D. S., Crossley, S. A., & McCarthy, P. M. (2010). Cohesion, Coherence, and Text Comprehension: Theoretical Perspectives and Assessment Approaches. Text and Talk, 30(3), 331-344.
- Flor, M., & Futagi, Y. (2012). On the Use of Automated Scoring for Assessing Coherence in Student Essays. Proceedings of the Seventh Workshop on Building Educational Applications Using NLP, 55-62.
- Zhang, A., Zhao, X., & Xie, J. (2023). The Impact of AI Language Models on Writing in Higher Education: A Case Study with ChatGPT. Journal of Educational Technology Research, 15(2), 45-67.
- Brown, G., & Yule, G. (1983). Discourse Analysis. Cambridge University Press.
- Sullivan, M., Kelly, A., & Mclaughlan, P. (2023). ChatGPT in higher education: Considerations for Academic Integrity and Student Learning.
- Abd-Elaal, E., Gamage, S. H. P. W., & Mills, J. E. (2022). Assisting academics to identify computer-generated writing. European Journal Of Engineering Education,
- Yeo, M. (2023). Academic integrity in the age of artificial intelligence (ai) authoring apps.
- Mizumoto, A., & Eguchi, m. (2023). Exploring the potential of using an ai language model for automated essay scoring.
- Fitria, T. N. (2021). Grammarly as AI-powered English writing assistant: students' alternative for writing English. The Journal Of English Language And Literature.
- Urlaub, P., & Dessein, E. (2022). From disrupted classrooms to human-machine collaboration? The pocket calculator, Google translate, and the future of language education.
- Tate, T., Doroudi, S., Ritchie, D., Xu, Y., & Warschauer, M. (2023). Educational research and ai-generated writing: confronting the coming tsunami.
- Farrokhnia, M., Banihashem, S. K., Noroozi, O., & Wals, A. E. J. (2023). A SWOT analysis of ChatGPT: implications for educational practice and research.
- Pandita, V., Mujawar, A. M., Norbu, T., Verma, V., & Patil, P. (2024). Text origin detection: unmasking the source – AI vs human. 5th International Conference For Emerging Technology (Incet)

- Rathi, N. (2020). Study on AI performance and possibilities for future wars. The International Journal Of Management.

- **Yao, Z., Nguyen, H., Srivastava, A., & Ambite, J. L. (2025).** Task-agnostic federated learning.
- **2. Wu, J., Chen, S., Heo, I., Gutfraind, S., Liu, S., Li, C., Srinivasan, B., Zhang, X., & Sharps, M. (2025).** Unfixing the mental set: Granting early-stage reasoning freedom in multi-agent debate.
- **3. Hu, Q., Peng, Y., Zhang, C., Lin, Y., U, K., & Chen, J. (2025).** Building instance extraction via multi-scale hybrid dual-attention network. *Buildings*, *15*(17), 3102. https://doi.org/10.3390/buildings15173102
- Ahmad, N. R. (2025). *From bailouts to balance: Comparative governance and reform strategies for Pakistan's loss-making state-owned enterprises*.